2012 River Herring Stock Assessment

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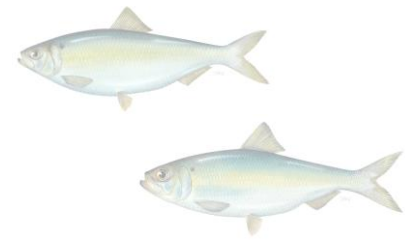**Dr. Gary Nelson**, Massachusetts Division of Marine Fisheries
Robert Sadzinski, Maryland Department of Natural Resources
Kate Taylor, Atlantic States Marine Fisheries Commission
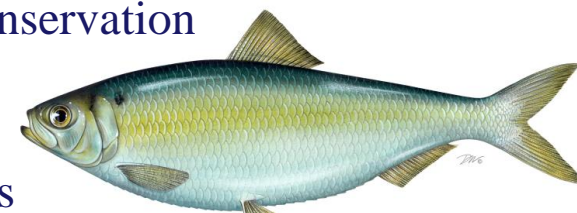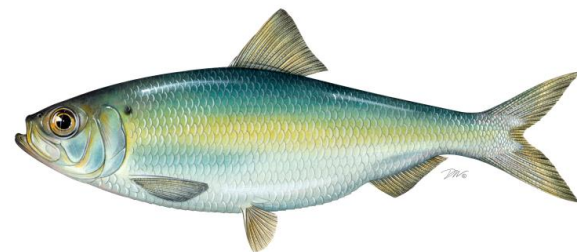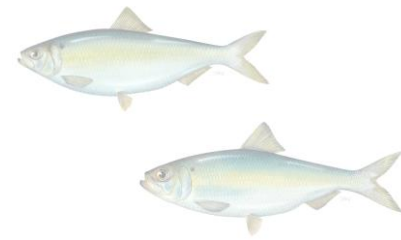
Outline

➢Overview of state & regional data sets

➢Coast-wide comparisons & trend analysis

  o Total landings & incidental catch

  o Biological data

  o Total mortality estimates

➢Stock assessment models

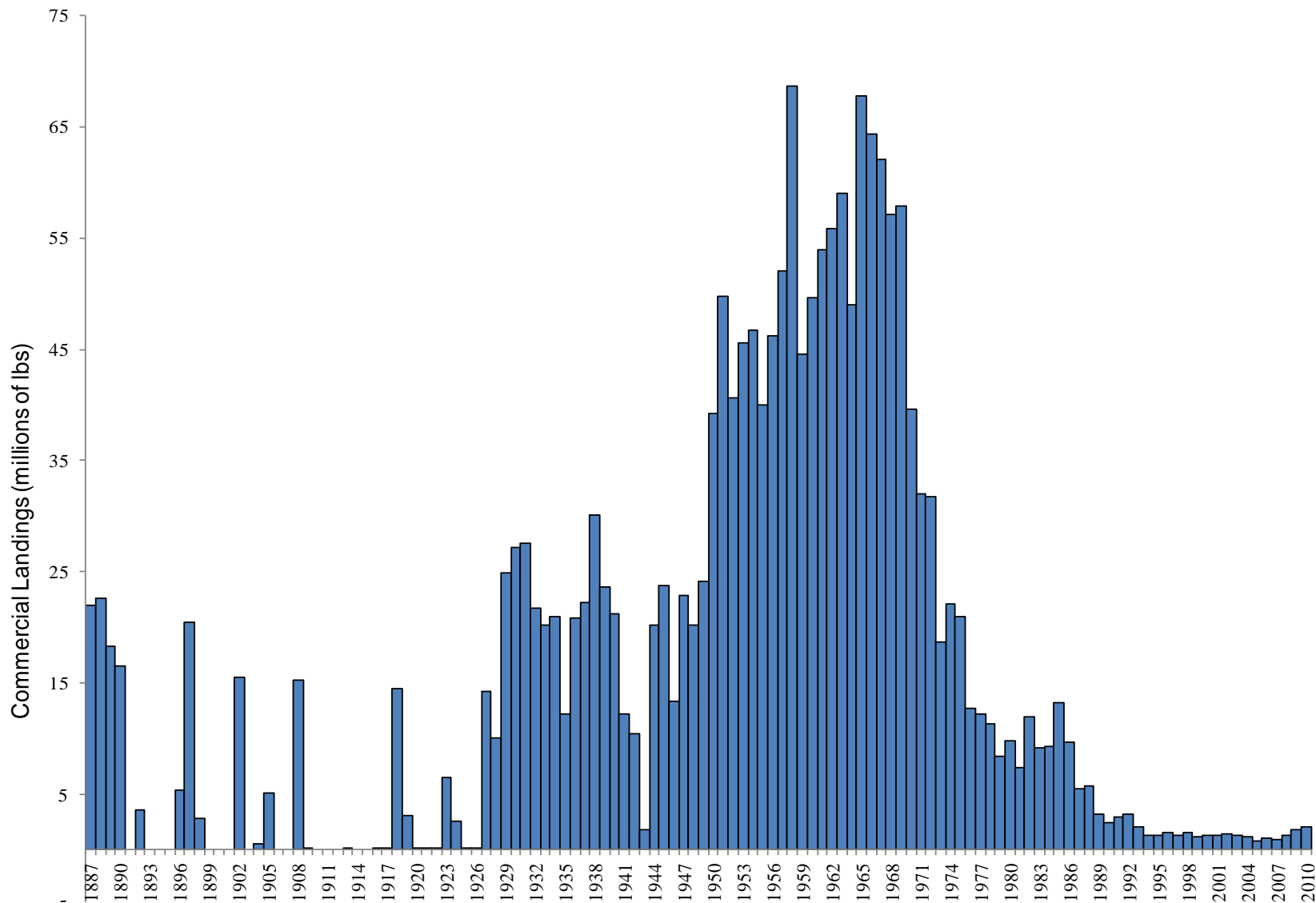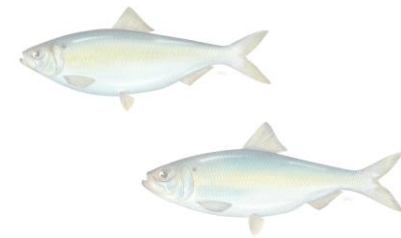➢Conclusions

Data Overview

> ### 57 "systems" on Atlantic coast
> - 9 FI & FD data categories
>
> ### 54% are blank
>
> ### Only 26% have complete or "good" data
> - Most occurs in NE states

State	River	Time series	By species	Harvest	Age	Length	Weight	Repeat Spawner	FI Adult	FI JAI	FD CPUE
ME	Damariscotta	1943-2010		•							
	St. George	1943-2010		•							
	Union	1975-2010		•							
	Orland	1943-2010		•							
	Androscoggin	1983-2010	•		•	•					
	Sebasticook	2000-2010	•		•	•				•	
	Merrymeeting Bay/Tribs	1979-2009	•			•					
	Gulf of Maine	2000-2010	•						•		
NH	Exeter/Squamscott	1991-2010	•	•	•	•		o	•		
	Lamprey	1991-2010	•	•	•	•		o	•		
	Winnicut	1991-2010	•	•	•	•		o	•		
	Oyster	1991-2010	•	•	•	•		o	•		
	Cocheco	1991-2010	•	•	•	•		o	•		
	Taylor	1991-2010	•	•	•	•		o	•		
	Great Bay Estuary	1997-2010	x			x				x	
MA	Mattapoisett	1988-2010	•	•	o	o	o		•		
	Monument	1980-2010	•	•	o	o	o	o	•		
	Nemasket	1996-2010	•	•	o	o	o		•		
	Parker	1971-1978, 2000-2010	•	•	o	o			•		
	Town	2000-2010		•					•		
	Agawam	2006-2010		•	o	o					
	Back	2007-2010	•	•	•	•					
	Charles	2008-2009		•	•	•	•	•	•		
	Mystic	2004-2010	•	•	•	•	•	•	•		
	Quashnet	2004	•	•	•	•	•				
	Stony Brook	1978-2004	•		o	o	o	o	o		
RI	Gilbert Stuart	1981-2010			•	•	•	•	•	o	
	Nonquit	1999-2010			•	•	•	•	•	o	
	Buckeye Brook	2003-2010									
	Pawcatuck	1988-2010			x	x	x	x	o	•	
	Ocean waters	1979-2010				•			•		
	Naragansett Bay	1988-2010				•			•		
	Coastal ponds	1992-2010				•			•	•	
CT	Bride Brook	1966-1967, 2003-2011	•		o				•		
	Connecticut River	1975-2011	•		o				•	o	
	Farmington River	1976-2011	•								
	Thames River	1996-2011	•								
NY	Hudson	1975-2010	•	o	o	o		o	o	o	o
DE, NJ, PA	Delaware River	1980-2010	o	o		o			o	o	o
	Delaware Bay	1966-2010	o	o					o	o	o
MD	Nanticoke	1959-2010	o		o			o		o	o
	Susquehanna	1972-2010	o							x	
	Chesapeake Bay	1959-2010			o						o
MD, VA, DC	Potomac River	1959-2010		•		o			o	o	o
VA	James	1966-2010	o	•	o	o	o	o	o	o	o
	Rappahannock	1966-2010	o	•	o	o	o	o	o	o	o
	York	1966-2010	o	•	o	o	o	o	o	o	o
NC	Albemarle Sound	1972-2009			o			o	o	•	
	Chowan River	1972-2009	•		•	•	•	o		•	•
SC	Wynah Bay									x	
	Santee-Cooper	1969-2010	o	•	o	o	o	o	o	x	•
	Savannah River									x	
	Ashley-Combahee-Edisto Basin									x	
GA	Altamaha River	2010								x	
	Ogeechee River	2010								x	
	Savannah River	2010								x	
FL	St. John's River	2001-2010	•			•			•	o	

Reported US Landings

Reported NAFO Landings

Chart: Reported Landings (Thousands of MT) from 1960 to 2010, comparing USA and Foreign Fleets. Y-axis ranges from - to 70. X-axis shows years 1960, 1962, 1964, 1966, 1968, 1970, 1972, 1974, 1976, 1978, 1980, 1982, 1984, 1986, 1988, 1990, 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010.

Legend: ■ USA □ Foreign Fleets
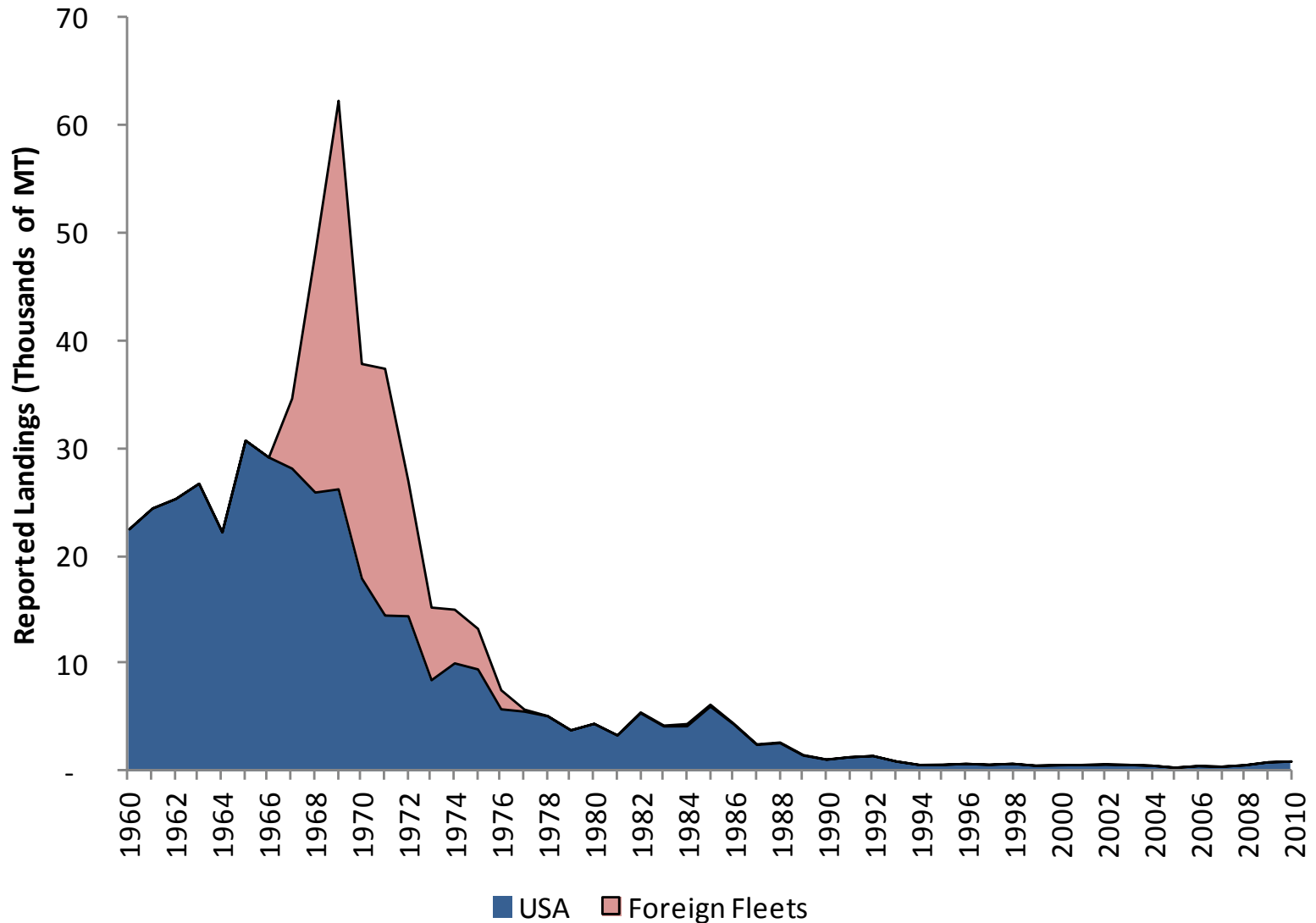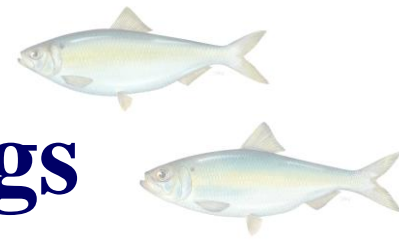
Total annual incidental catch by species

Metric tons (y-axis): 0, 200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800

X-axis years: 1989, 1992, 1995, 1998, 2001, 2004, 2007, 2010

Legend:
- Alewife
- Blueback herring

CV's: alewife: 0.20 – 3.86
      blueback: 0.20 – 2.10

MWT estimates only included beginning in 2005
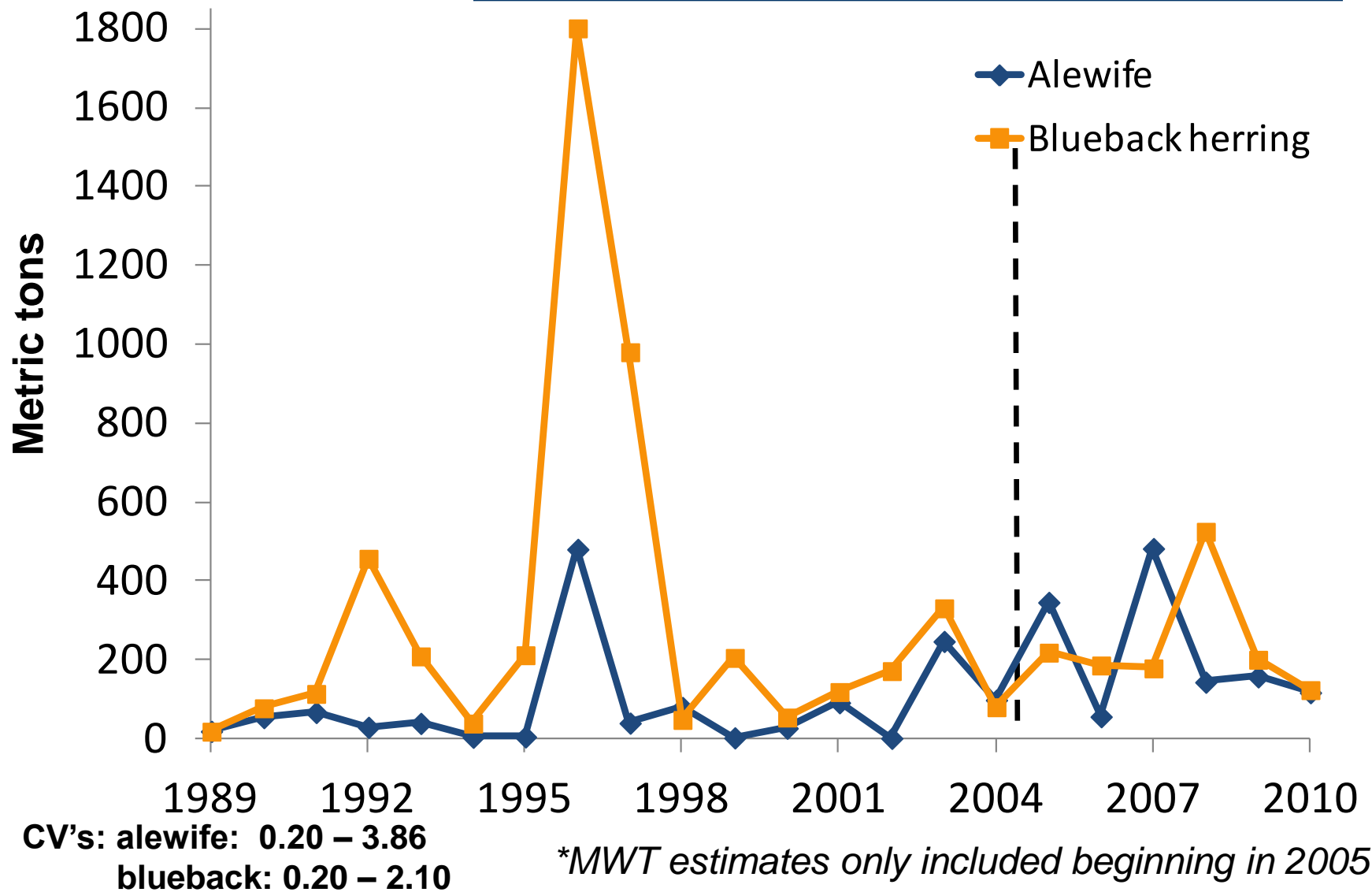
Biological Data
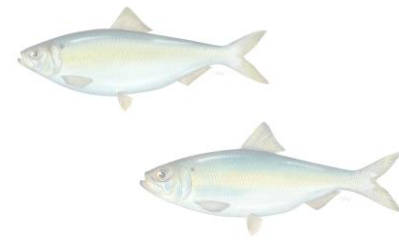
➢ Observers also collect data on length frequency of incidental catch

➢ **Incidental catch included small fish of size classes not observed in river samples**

Alewife size distributions

BT
MWT
NH Inland

Blueback herring

Frequency

Fork length (mm)
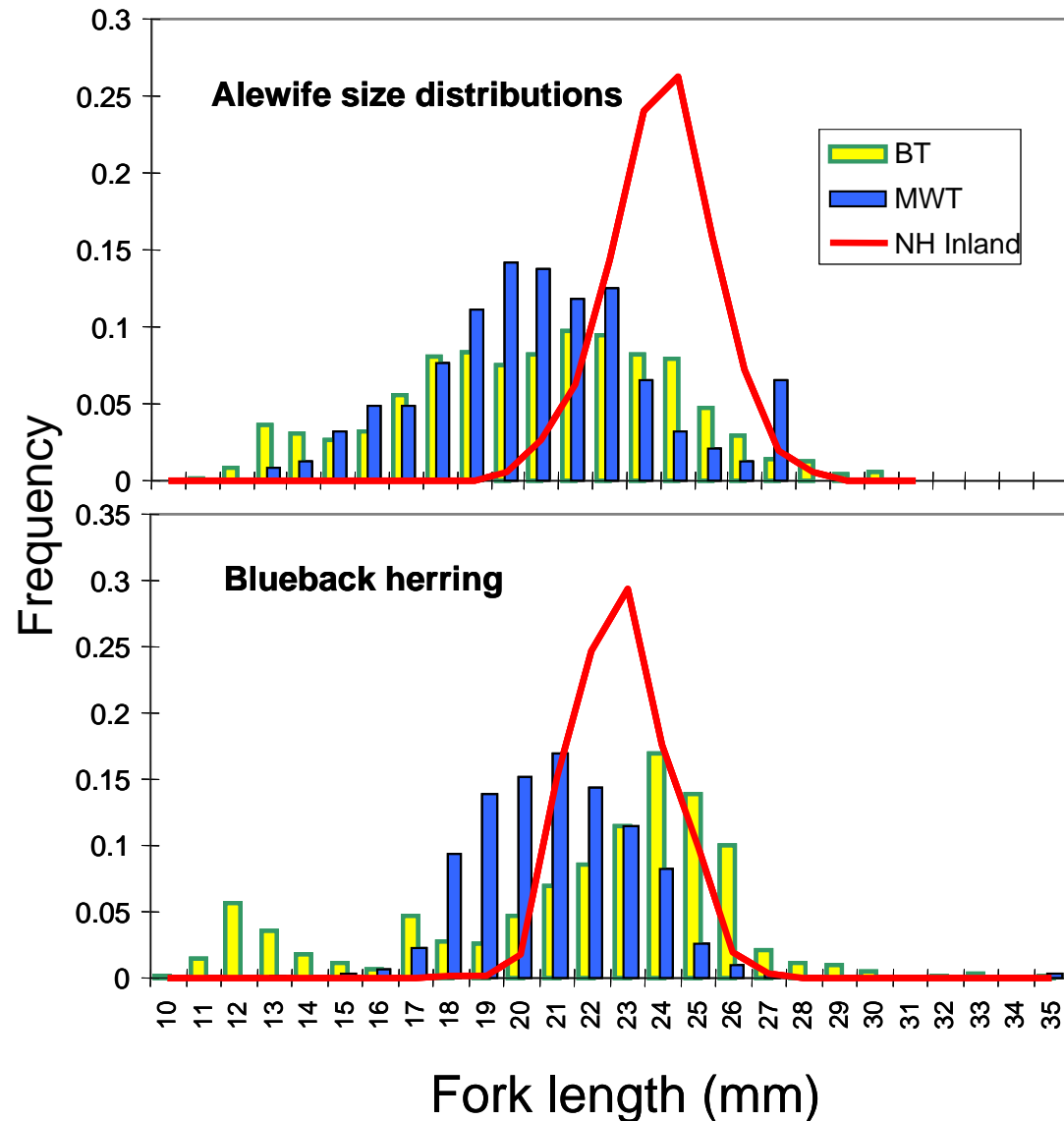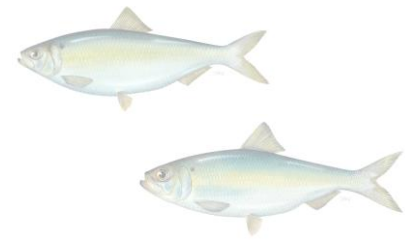
Trend Analysis

➢ Commercial CPUE (NY, NJ, MD, PRFC, VA, NC, SC)

➢ Run Sizes (ME, NH, MA, RI, CT)

➢ YOY Indices (ME, RI, CT, NY, NJ, MD, DC, VA, NC)

➢ Trawl Surveys (NEFSC, MA, RI, CT, NJ, NC)

➢ Mean length and length-at-age (ME, NH, MA, RI, NY, MD, NC, SC, FL)

➢ Repeat Spawners (ME, NH, MA, RI, NY, MD, NC, SC)

➢ Total Mortality (ME, NH, MA, RI, MD, NC, SC)

Commercial CPUE
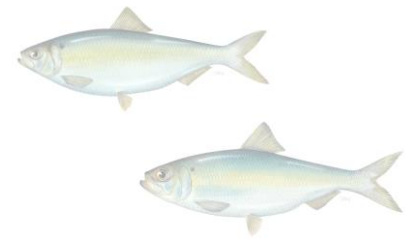
Alewife:

3 of 4 series showed historical declines and some increases in recent years.

Blueback:

2 of 3 series have declined or are showing declines in recent years.

Combined Species:

3 of 4 series have declined.
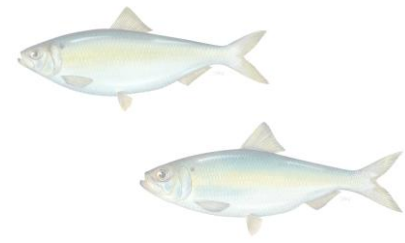
Run Sizes

- Run sizes for alewife, blueback herring and combined species showed historical and recent (1999-2007) declines in abundance.

- Alewife/Combined Species run sizes in eight of nine NE rivers (with long time series: 1984-2010) showed historical declines (mid 1990s or after 1999-2000) but have increased in the last 2-3 years.

- Blueback run sizes in two of two NE rivers declined over time (as early as 1985).

- Population sizes in Chowan River, NC declined precipitously after 1985 and abundance remains low.

YOY FI Surveys
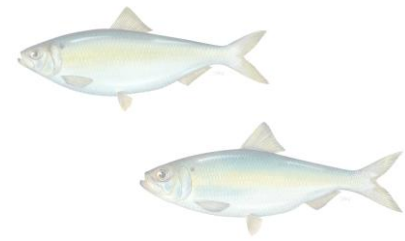
➢ **For recent years (2000-2007):**
  o **Alewife:**
    → **3 indices declining**
    → **3 indices showed no trend**
    → **1 index increasing**
  o **Blueback from eight rivers showed:**
    → **4 rivers showed no trend**
    → **4 rivers declining**
➢ **Similar patterns among indices from the same region**
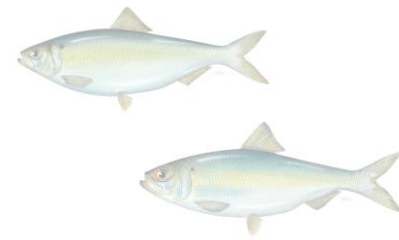
FI Trawl Surveys
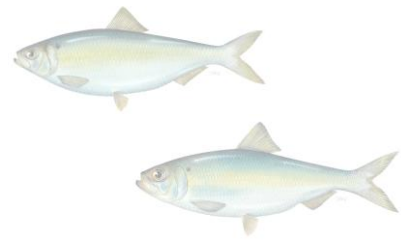
➤ **Alewife**

  o **Increasing trend: 4 surveys**

  o **Flat/no trend: 3 surveys**

  o **Decreasing trend: 1 survey**

➤ **Blueback herring**

  o **Increasing trend: 2 surveys**

  o **Flat/no trend: 4 surveys**

  o **Decreasing trend: 2 survey**

Mean Length

➢ **Mean length of male and female alewife and blueback herring have declined over time by 13-45 mm TL in 7 of 13 rivers examined**
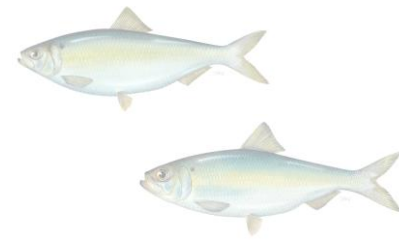
➢ **Significant declines for rivers with long time series**
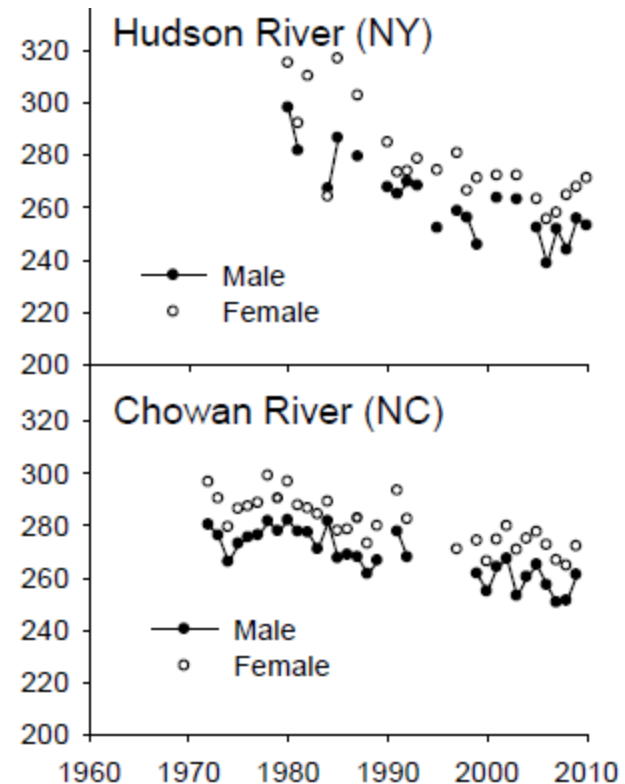
Maximum Age Observed

➢ **Alewife maximum age has declined by 1 to 2 ages in MA, RI, MD and NC. Trends in ME and NH have been stable or increasing.**

➢ **Blueback maximum age has declined by 1 to 4 ages in MA, MD and NC. Trends in NH have been stable or increasing.**
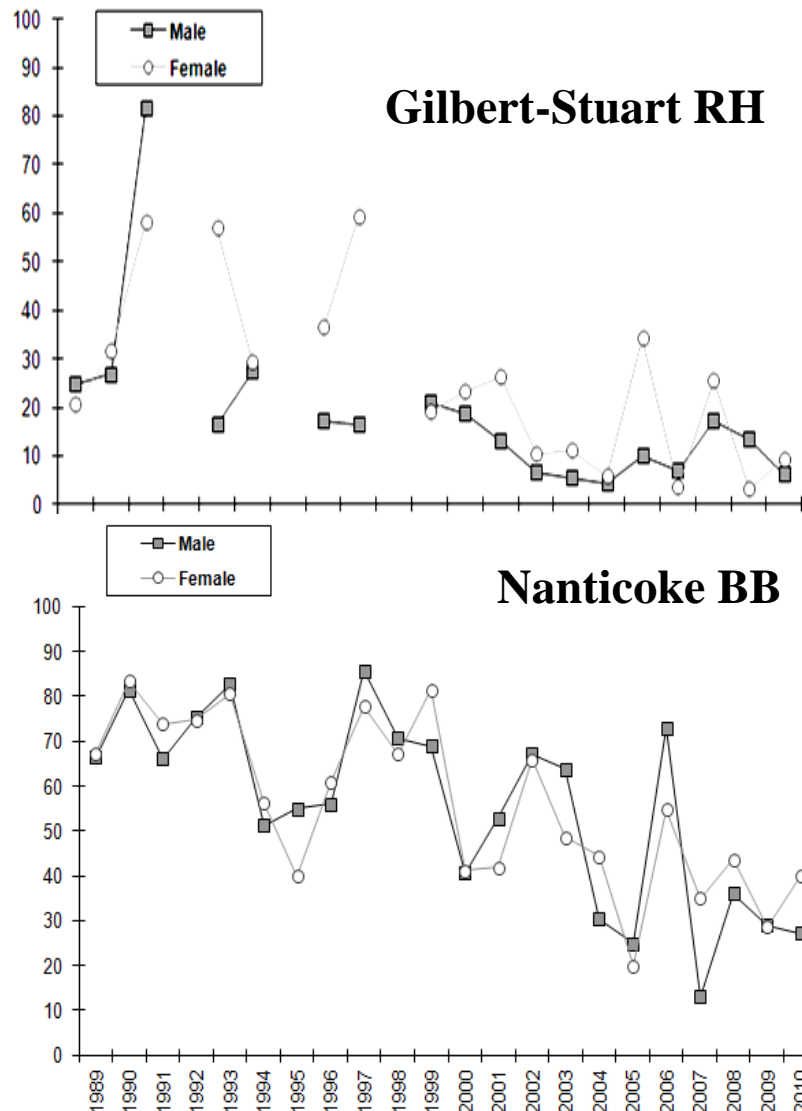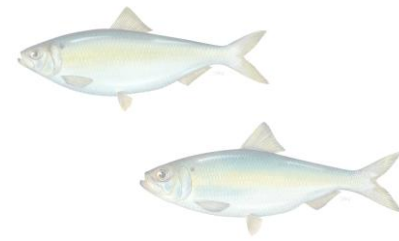
Length-at-Age

➢ **Significant declines in mean length for one or more ages in:**

  o **Alewife – ME, NH, RI, MD and NC**

  o **Blueback – NH, MD, NC**

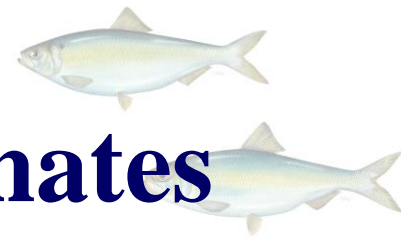## Alewife

Repeat Spawner Data
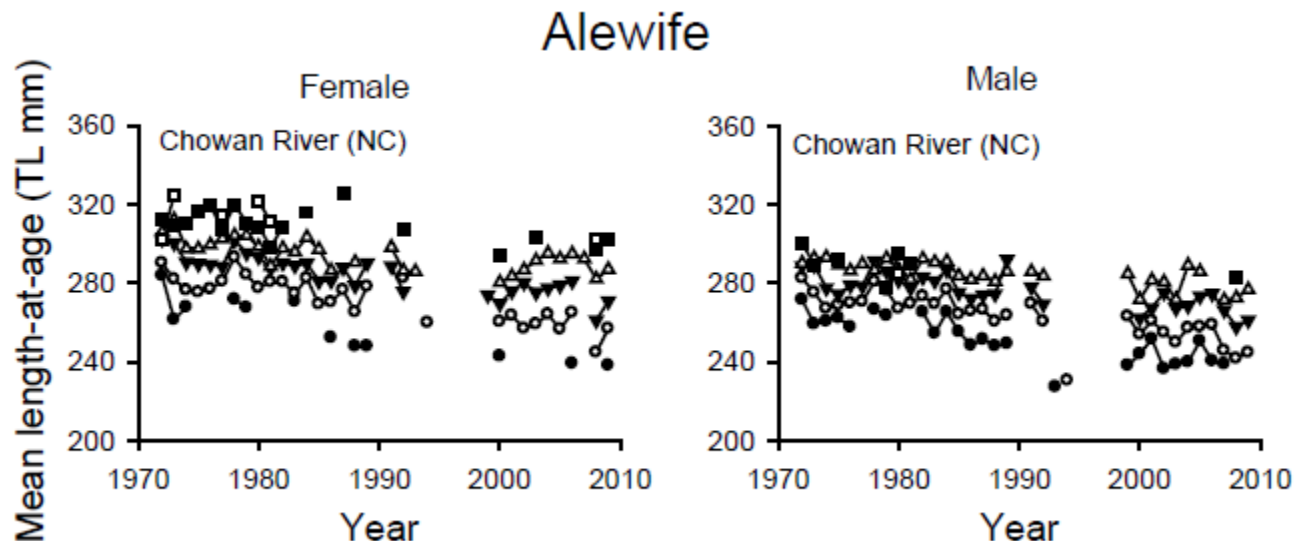
Gilbert-Stuart RH

Nanticoke BB

- Data available from 12 rivers
- Few datasets with time series

- **Declining** trends in the **Gilbert-Stuart River (RI)** for combined species and **Nanticoke River** for blueback herring only

- **No or little trends in the remaining rivers**

Total Mortality (Z) Estimates

- **Developed from observed age-structure**
- **Chapman-Robson – least biased estimator**
- **At least 3 age classes must be present**

Z Benchmarks

➤ **Total mortality was high for all stocks examined**

➤ Three year average of observed Z values were **above** the $Z_{20\%SPR}$ **benchmark for 12 of the 18 stocks.**

➤ Three year average of observed Z values were between the $Z_{40\%SPR}$ and $Z_{20\%SPR}$ **benchmarks for the remaining 6 stocks.**
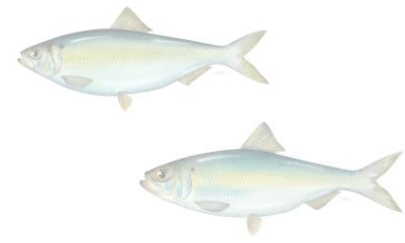
Coastwide Model

➢ Depletion-Based Stock Reduction Analysis (**DB-SRA**)

➢ Developed on the west coast to generate management parameters (e.g., MSY) for data-poor species

➢ SASC & Peer Review Panel had concerns about model structure and assumptions and recommends further development
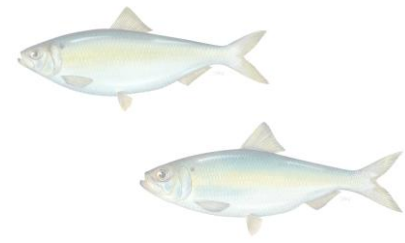
Conclusions

➢ **River herring have declined coast-wide**

- Declining commercial landings following the 1960s
- Declining commercial CPUE
- Declining run counts in many rivers
- Declines in average length and size-at-age in many rivers
- SCAA and DB-SRA model runs

➢ **Fisheries independent indices were quite variable**

- Most started after the decline in commercial landings
- Currently observing relatively small amounts of inter-annual variation
- Regional (north vs. south) patterns may be due to climate change
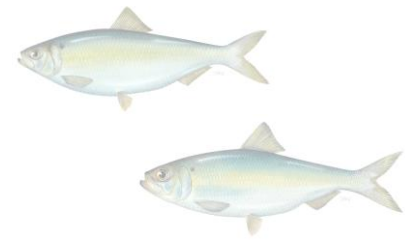
Stock Status

➢ **The coastwide meta-complex of river herring on the US Atlantic coast is depleted to near historic lows**

➢ "Depleted" status indicates that there was evidence for declines in abundance due to a number of factors, but the relative importance of these factors in reducing river herring stocks could not be determined.
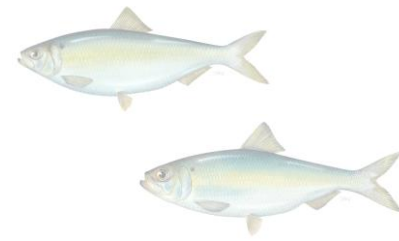
Stock Status

➢ **52 in-river stocks** for which data were available

○ **Historically:**

→ **22 were depleted**

→ **1 stock was increasing**
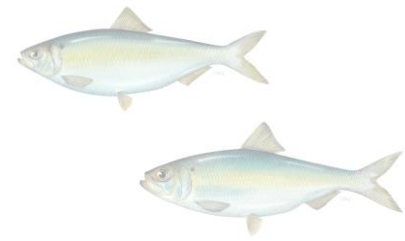
→ **28 stocks could not be determined**

○ **In most recent years:**

→ **2 were increasing**

→ **4 were decreasing**

→ **9 were stable**

→**38 rivers did not having enough data**

Stock Status

➢ **Overfished and overfishing status could not be determined for the coastwide stock complex**

➢ **Management actions to reduce total mortality are needed.**

➢ **Recovery of river herring stocks will need to address multiple factors** (e.g., fish passage, predation, water quality, climate change, etc.) in addition to harvest.